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ABSTRACT

The purpose of the study was to investigate children's understanding of "before" and "after" in temporal directions, in temporal questions, and in pictorial events through the use of three interview methods. The subjects for the study were 62 children, ranging in age from 40 to 60 months, enrolled in a half-day, private nursery/kindergarten center. There were 27 boys and 35 girls. One-way analysis of variance on the total before/after scores showed significant differences by age. Similar results were found for the before score. Pearson correlations revealed significant positive moderate correlations between the tasks. Findings of no differences between the mean responses to the before items and to the after items indicated that comprehension and interpretation of the two concepts were similar. (Author)

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COMPREHENSION OF "BEFORE" AND "AFTER" BY THE YOUNG CHILD

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Comprehension of "Before" and "After"

by the Young Child

"When children enter a structured school environment they are, often for the first time, required to follow sequential directions rather explicitly" (Barrie-Blackley, 1973, p. 164). Clauses joined with time connectives are commonly used by teachers in explanations, directions, and requests to children. Some children have little difficulty following these temporal directions. Many young children are able to carry out the commands through selective ignoring of the time connectives either from practice--"washing hands after painting"--or by observing the nonverbal actions of the adult or peers to see what is expected (Hatch, 1971). These contextual clues may be largely responsible for the child's comprehension of the directions without a real understanding of some of the temporal words.

Teachers know that some children do have trouble understanding commands involving two or more parts connected with temporal conjunctions. Studies of words like "and", "first/last", "until", and "before/after" have been done. These have indicated that particular time connectives used and their order of use affects comprehension. Commands connected with "and" are easily understood indicating that memory is not the problem (Amidon & Carey, 1972), yet the same commands using "before/after" are misunderstood. In a similar manner, children are able to understand "first/last" commands more easily than "before/after" ones.

Two basic theories have emerged from research concerning "before/after". Clark (1971) has proposed a semantic features model in which "before" and

"after" are learned in a series of stages based on their semantic features or components. Under this model the child progresses from knowing neither "before" nor "after" and using an order-of-mention strategy, to knowing "before" and still using order-of-mention for "after". In the third stage the child knows "before" and for the child "after" also means "before". In Clark's fourth stage the child knows both terms.

Another theory, advocated by Amidon and Carey (1972), is based on a syntactic model. The syntactic model says difficulty understanding "before" and "after" is due to problems in processing subordinate clause structure. Studies under this theory have found "after" to be interpreted correctly more often than the term "before". This is the opposite of Clark's finding (1971).

Coker (1978) has proposed that these studies over look the confounding interaction of semantics and syntactic structure. Her study found no fixed order of acquisition. She did find that young children seem to understand the words first as prepositions and then as conjunctions. As subordinating conjunctions, order-of-mention and main-clause-first were two strategies employed by the child in interpreting the temporal terms.

The purpose of the present study was to investigate children's understanding of "before" and "after" in three situations: temporal directions, temporal questions, and pictorial events. Three interview methods were used. The three methods, "before/after" sentences, "before/after" pictures, and "before/after" production, were modeled on methods previously used in the study of temporal relationships.

The "before/after" sentence task consisted of twelve sentences representing four basic sentence types which were read to each child. The child

was to act out the events presented in each sentence using a set of simple toys. The sentences were similar to those identified by Amidon and Carey (1972) and Ferreiro and Sinclair (1971) in their studies of temporal relationships. Examples of the sentences used are:

1) Before you string the beads, rub the cat.
2) After you give me a block, give me the pencil.
3) Pick up the pencil before you pick up the crayon.
4) Tell me your name after you give me a crayon.

The "before/after" picture task consited of ten pairs of pictures illustrating a sequence of events which were randomly shown to each child. The child was asked to explain the events in terms of sequence. The pairs of pictures included such things as whole apple and an apple core, a baby swinging and a baby falling from the swing, plus eight other pairs of events. Jarvella and Lubinsky (1975) had investigated the use of such pictures for testing understanding of temporal order by deaf children.

In the "before/after" production task the child was asked to identify the order of two events acted out by the interviewer. Eight pairs of events were illustrated using a set of toys. Following each pair, the child was asked to identify when one of the events occurred. For example, the interviewer would give the child a book and then a pencil. The child was asked, "When did I give you a pencil, before or after I gave you the book"? Ferreiro and Sinclair (1971) concluded that the use of "when" questions in similar production tasks aided the child's understanding of the concept.

The subjects for the study were 62 children ranging in age from 40 months to 80 months enrolled in a half-day, private nursery/kindergarten center. The children were white, middle class monolinguals. There were 27 boys and 35 girls.

Each subject was interviewed individually by one of three investigators in a vacant room at the center. Each investigator followed a set of written directions. The three "before/after" tasks were part of a series of tasks completed by each child.

Each subject received a score for each task based on the number of correct responses. A total "before/after" score represented the sum of the three tasks. A "before" score was oomputed by counting the number of correct responses to "before" items on the "before/after" sentence task and the "before/after" production task. An "after" score was the sum of correct answers to the "after" items on the same two tasks. All statistical analyses were run using an SPSS (1975) computer program. An alpha level of .05 was selected.

A one-way analysis of variance on the total "before/after" score showed significant differences by age, $F_{3,58} = 27.08$, $p = 0.001$. The 3s and 4s got less than 50% correct; the 5s and 6s got over 84% correct. Post hoc analysis using the Student Newman-Keuls procedure indicated homogeneous subsets for ages three and four and for the five and six-year olds. The significant difference was between the subsets. Table 1 shows the means and deviations by age.

Place Table 1 about here.

Similar results were revealed by analysis of the "before" score, $F_{3,58} = 35.39$, $p = 0.001$, and for the "after" score, $F_{3,58} = 15.65$, $p = 0.001$. Table 2 presents the means for "before" and also for "after". The Newman-Keuls procedures indicated that five and six-year-old scored significantly higher than three and four year olds on both "before" and "after".

Place Table 2 about here.

The "before" scores and "after" scores were converted to percentages since there were an unequal number of items. A t-test using the converted scores revealed no significant differences between the concepts, $t_{61} = -1.11$, $p = 0.27$. The means were 0.54 for "before" and 0.59 for "after". The standard deviations were 1.25 and 1.52, respectively.

Pearson correlations which revealed significant positive, moderate correlations between the tasks ranged from .51 to .65. These are shown in Table 3.

Place Table 3 about here.

Each task was analyzed using sex and combined ages, 3s with 4s and 5s with 6s. Table 4 presents the analyses of variance. There were no significant differences by sex for any of the three tasks. There were significant differences by age with the older group scoring significantly higher each time. Table 5 presents the means and deviations for each task.

Place Tables 4 & 5 about here.

Discussion

The finding of no difference between the mean responses to the "before" items and to the "after" items indicates that comprehension and interpretation of the two concepts are similar. This finding fails to support the conflicting conclusions of Clark (1971) who said "before" precedes

acquisition of "after" and Barrie-Blackley (1973) who found the opposite. The percentage of correct responses for all ages especially the 5s and 6s seems to indicate that the children in the study may have a better understanding of "before/after" than would be expected from reviewing other research of temporal connectors.

Some differences in understanding the combined concepts were to be expected for the different ages. However, the sharp contrast between the 4s and 5s raised some distinct questions. Why was there such a large change in the number of correct responses? Was the difference due to the developmental pattern of the young children? If so, what was the nature of such differences. If the differences were due to learning, then this implies that temporal concepts may be taught. Amidon and Carey found that providing children with feedback concerning responses facilitated appropriate strategies in attending to clauses involving temporal connectors (1972).

It must also be noted that a series of cognitive tasks and some standardized cognitive measures given to the subjects in the study correlated positively with the "before/after" scores. They tended to correlate more highly with "after" than with "before". These results need more study.

The similar findings for each task and the correlations among the tasks used in the study indicated that the three "before/after" tasks are related. Each task seems suitable for investigating the child's understanding of "before" and "after" in temporal directions, questions, and pictorial events.

Implications of the study

Direct implications of our study and the research of others regarding temporal connectors indicates a need for teachers to be aware that children

often fail to follow directions not out of willful disobedience or inattention, but from their lack of understanding of time connectives. Teachers either must modify their verbal interactions with children or enhance opportunities for children to learn the semantic/syntactical variances in our language.

Investigations of time connectives should be explored with more emphasis on assessing the cognitive levels of the children involved in the studies. Tentative analysis of data from this study indicated differences in correlations of "before/after" to number facility and spatial relations. (See Cannella et al, 1978.)

A more general implication regards assessment of other aspects of a child's language development. Observation and informal surveys using materials readily available to the teacher should be continuously done by teachers. Assessment need not be limited to formal, standardized procedures. Results of the surveys should be applied in the classroom.

Table 1

Means and Standard Deviations

by Age for the Before/After Total

Age	n	M	SD
3	7	13.14*	3.18
4	15	14.67	7.13
5	25	25.96	4.35
6	15	26.26	3.96

*Maximum score was 30.

Table 2

Means and Standard Deviations

for Before and After by Age

Age	Before*		After**	
	M	SD	M	SD
3	4.86	1.86	4.57	3.05
4	5.00	2.27	4.47	2.67
5	9.29	1.08	8.21	1.79
6	9.07	1.10	8.73	1.58

*There was a possible total of 11 before items.

**Maximum number of after items was 9.

Table 3

Correlational Matrix of the Before/After Tasks

Task	1	2	3	4
Sentences (1)	1.00	0.51	0.56	0.83
Pictures (2)		1.00	0.65	0.85
Production (3)			1.00	0.86
Combined (4)				1.00

Table 4

Analyses of Variance for the Three Tasks

Source of Variation	df	MS	F	p
Before/After Sentences				
Sex	1	1.56	0.25	0.999
Age	1	258.20	41.58	0.001
Sex X Age	1	0.22	0.03	0.999
Within	58	6.21		
Total	61	10.51		
Before/After Pictures				
Sex	1	1.02	0.15	0.999
Age	1	187.00	27.72	0.001
Sex X Age	1	0.56	0.08	0.999
Within	58	6.75		
Total	61	9.52		
Before/After Production				
Sex	1	1.23	0.28	0.999
Age	1	160.87	36.82	0.001
Sex X Age	1	12.05	2.76	0.098
Within	58	4.37		
Total	61	7.00		

$\alpha = 0.05$

Table 5

Means and Standard Deviations for the Three Tasks by Sex and Age

	Boys	Girls	3 and 4	5 and 6
	Before/After Sentences			
M	9.04	8.80	5.95(50)*	10.31(86)*
SD	2.93	3.41	3.04	2.08
	Before/After Pictures			
M	7.19	7.51	4.85(49)**	8.57(86)**
SD	3.27	2.97	3.12	2.34
	Before/After Production			
M	5.70	5.49	3.25(41)***	6.69(84)****
SD	2.33	2.89	2.47	1.88

* Percentage of maximum total of 12.
** Percentage of maximum total of 10.
*** Percentage of maximum total of 8.

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